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LASER SCRIBED LABYRINTH TYPE CIRCUIT FOR CIRCUIT BOARD

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FIG. 1

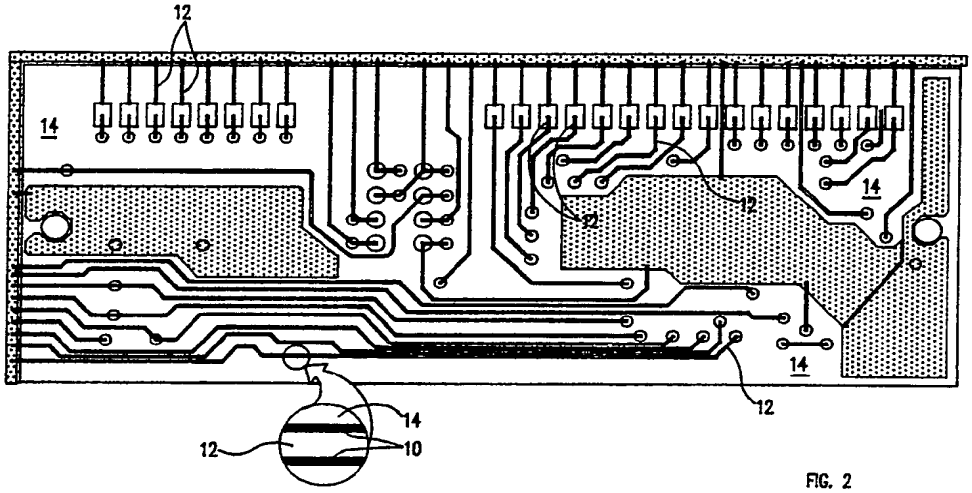
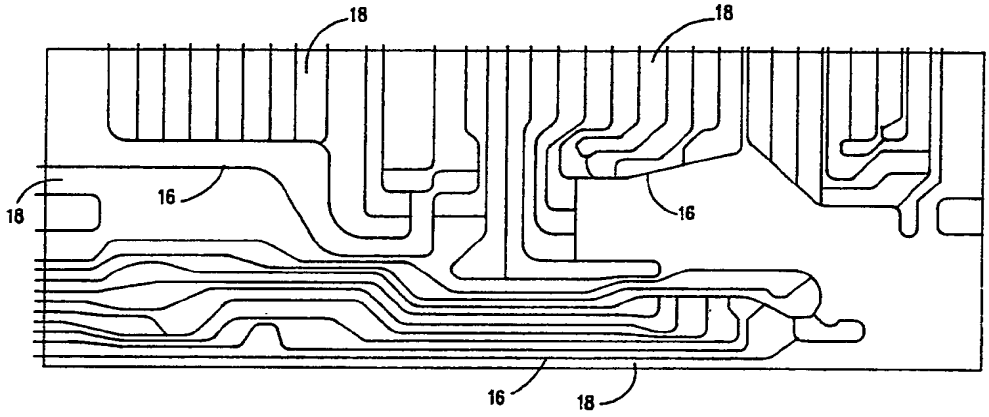


FIG. 2



One conventional way of providing a circuit pattern on a circuit board substrate is to blanket plate or vapor deposit or otherwise apply a metal layer to the surface of a dielectric material to form a circuit board. Following this, some type of subtractive process is used to remove the metal from the areas where circuit lines are not desired, leaving metal at the desired circuit lines or pattern with the regions where the metal has been removed acting as a dielectric between the circuit lines.

In one technique, a laser is utilized to scribe around each circuit line to be formed. This is depicted in Fig. 1 wherein a circuit board having a metal blanket deposited thereon is shown. A circuit

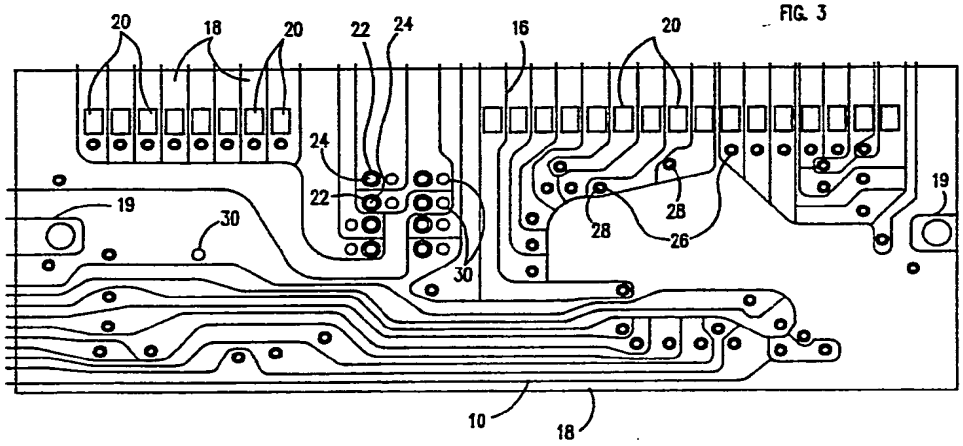


FIG. 3

pattern is scribed thereon by means of laser technology wherein the laser beam follows around the desired circuit pattern removing the metal shown in the areas shown in heavy outline 10, thus defining individual circuit pads and circuit lines 12 in the desired pattern with the desired connections between the pads and lines. This requires a great deal of laser manipulation and very extensive traversing of the scribe. The result is rather narrow circuit lines separated by very narrow dielectric spaces, with the narrow circuit lines being separated from very large nonfunctioning areas of metallization 14.

Fig. 2 shows an improved labyrinth design which is produced by laser scribing of a metallized circuit board. In this case, the laser scribes a labyrinth design of narrow bands 16 to separate very wide metal areas 18 which areas 18 act as conductors on which the required circuit elements can be mounted by surface mount technology (SMT) and pin-in-hole technology. The labyrinth circuit design is also capable of accommodating direct chip attach (DCA) technology. After lasing, additional plating can be supplied if required by electroless or electrolytic techniques depending on the circuit design to achieve the desired volume resistivity and/or special platings.

Additionally, after lasing, the application of a solder mask is an important step as it allows standard areas for electronic component placement to be defined. Fig. 3 shows how the various circuit components would be mounted to the wide circuit areas 18 and in the holes 24 through openings in the solder mask of labyrinth design of Fig. 2 to provide the same circuit configuration as shown in Fig. 1. The solder mask material covers all of the board surface except for openings 19 around tooling holes, rectangular areas 20 for SMT connections, round areas 22 around holes 24 for pin-in-hole connections, and round areas 26 around smaller holes 28 for vias. Openings 30 are for test point access.

FIG. 4

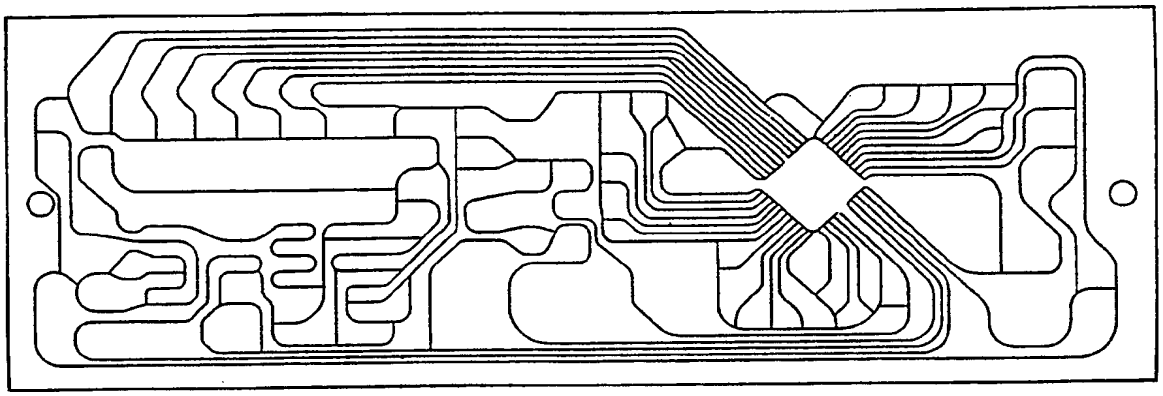
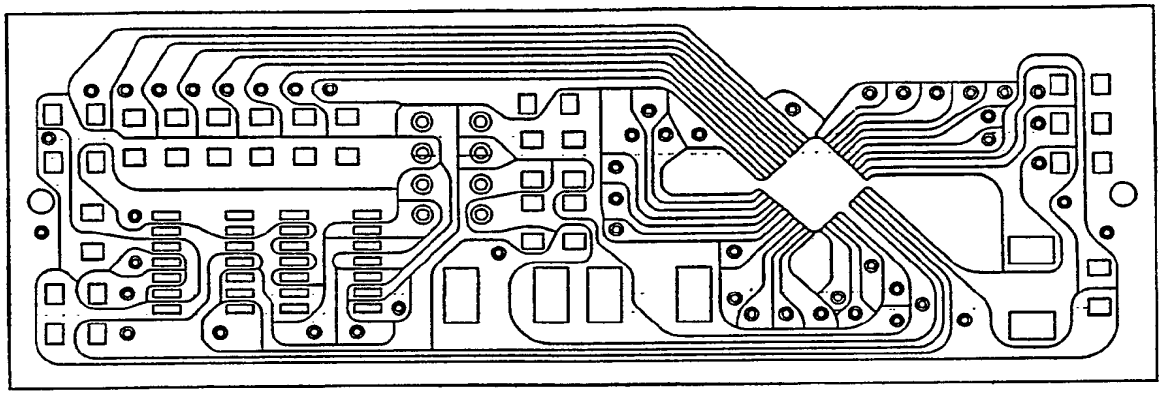


FIG. 5



This can be performed on both sides of a board to render a double-side, plated-through-hole circuit board. Fig. 4 depicts the side of the board opposite Fig. 2, and Fig. 5 depicts the side of the board opposite Fig. 3. All via and component holes are required to be drilled prior to metallization so that electrical connection to the other side of the circuit is established. The labyrinth circuit serves to isolate these holes with the laser etch, thus facilitating functional double-sided circuits.

In addition to simplifying the laser scribing operation, the labyrinth design significantly reduces the EMI losses and enhances the heat transfer characteristics by providing very wide conductor areas.